

1. Notes on the Anatomy of the Colies (*Colius*). By A. H. GARROD, M.A., F.Z.S., Prosector to the Society.

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About the systematic position of the Colies there has always been considerable uncertainty, partly on account of the peculiarities of their habits, and partly because their internal structure is but incompletely known. One of the examples of *Colius castanonotus*, sent to the Society by Mr. H. C. Tait, C.M.Z.S., having died just as it reached this country, I have had the opportunity of dissecting the bird, and of examining several of its special anatomical details.

Dr. Murie* has, not long since, given us an excellent *résumé* of the views entertained by different naturalists as to the systematic position of the Colies, few of which are based on any thing more than external form and habits. Burchell† placed them close to *Corythæix*; and he has been followed by many. Mr. Wallace‡, from a study of their habits, refers them to the Parrot tribe.

In his 'Pterylography' Nitzsch§ places *Colius* among his Amphibolæ, together with *Musophaga* and *Opisthocomus*, mentioning nevertheless that the genus "has a very remarkable arrangement of the feathers, and can only be compared in this respect with *Buceros*."

In his important memoir "On the Classification of Birds," Prof. Huxley|| places *Colius* among his Desmognathæ, in the smaller group Cocygomorphæ, the genus being the sole representative of one of its minor divisions. Prof. Huxley makes no special reference to the skull.

Dr. Murie has given us valuable information on the osteology of the bird¶; and I am able to confirm most of his observations. There is, however, one part of the skeleton (the palate) where my results differ considerably from those of my predecessor; and these it is necessary for me to record. Dr. Murie tells us that the specimen at his disposal was somewhat injured; nevertheless, of the maxillo-palatine processes of the maxillary bones, he says that they intrude but a slight way beyond the palatal rods, and leave a wide middle space betwixt them, and that, "as respects the presence of a vomer, there is apparently a short one, tapering rather than abruptly truncate anteriorly, and not visibly cleft behind." Dr. Murie therefore removes *Colius* from among Prof. Huxley's Desmognathæ, and consequently from the Cocygomorphæ.

In the preparation of the skull of my specimen of *Colius castano-*

* Ibis, 1872, p. 262.

† Travels in South Africa, vol. i. p. 214 (footnote).

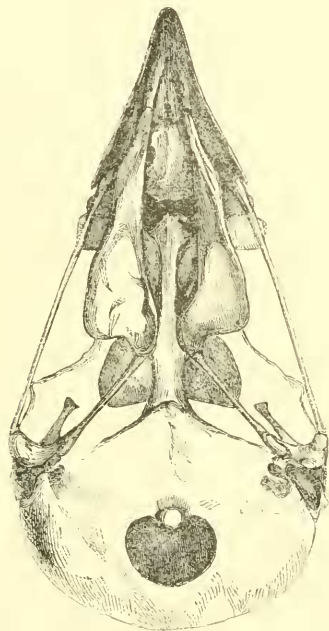
‡ Annals & Mag. of Nat. Hist. 1856, p. 213.

§ Ray Society's English Translation, edited by Mr. Selater, p. 107.

|| P. Z. S. 1867, p. 466.

¶ *Loc. cit.* p. 266, pl. x.

notus I have taken special care; and I find that the bird, as will be seen by the drawing which I exhibit, is without doubt desmognathous. Moreover, as the desmognathism apparently depends on the fusion of the feebly developed maxillo-palatine plates across the middle line as well as with the ossified nasal septum, it should, according to the valuable nomenclature of Prof. Parker*, be termed *direct* (of the first variety), as in the Falcons. It is not, however, possible to determine with certainty from the adult skull (from mine at least) whether the nasal septum has intervened between the maxillo-palatines, as in the Eagles, Vultures, and Owls,



Palate of *Colius castanonotus*, $\times 2\frac{1}{2}$.

and as it is in the Alcedinidæ, because in them there is a demonstrable interval between the free posterior ends of these plates, the intermediate septal bond but incompletely uniting them. A slightly more extensive ossification in this region would reproduce a Parrot's palate in that of the Coly.

Next, with reference to the vomer, the result of carefully watching the skull during maceration, and of a minute inspection of the palate in the prepared specimen, convinces me that that bone is not ossified. In thus lacking the vomer, *Colius* and *Alcedo* agree.

The sternum of my specimen closely resembles that figured by

* Trans. Zool. Soc. vol. ix. p. 293.

Dr. Murie; the crenulation, however, of the lateral margins of the keel-bearing middle xiphoid process is not apparent. The bone resembles that of the Capitonidæ more than the sternum of any other bird (see, for comparison, Eyton's 'Osteologia Avium,' plate 8).

In the structure of its soft parts *Colius* presents several interesting features which assist in the determination of its affinities.

The skin is particularly tough, much like that of the Swifts in this respect. Only one carotid artery is present, the left. In the Musophagidæ, Cuculidæ, Coraciidæ, Galbulidæ, and Alcedinidæ we know that both a right and a left artery are always developed*; whilst in the Bucerotidæ *Toccos* possesses only the left, *Buceros* having both,—the left only being found, as in *Colius*, in the Picidæ (*i. e.* Picinæ, Ramphastinæ, and Capitoninæ), Upupidæ, Meropidæ, Trogonidæ, and Passeres. As far, therefore, as the carotid arteries are concerned, the Colies do not resemble the Musophagidæ, their supposed nearest allies. The comparison with Parrots must be reserved till further on.

Myologically, *Colius* wants the *ambiens* muscle. It is therefore Anomalognatous †, and agrees with the passeriform and piciform birds only, differing essentially from the Musophagidæ. The *femoro-caudal* is well developed, but has no accessory head. The *semi-tendinosus* and its accessory head are both fairly developed. The myological formula of the bird on the system adopted by me in my paper on Classification, just referred to, is A,XY, the same as that of most passeriformes and piciformes, but differing importantly from that of the Musophagidæ (AB,XY) in the absence of B, the *accessory femoro-caudal* muscle. The *tensor fasciæ* of the thigh does not in the least cover the biceps muscle.

In the arrangement of its plantar tendons *Colius*, although so peculiar and uncertain in the manner in which it employs its toes, exactly resembles the feeble-footed Alcedinidæ, and hardly differs from the Coraciidæ, Meropidæ, Bucerotidæ, and Caprimulgidæ. In *Musophaga* the distribution of the tendons is on quite another principle, as it is in the Psittaci‡.

The intestines of *Colius* are voluminous and short, being only 9 inches in length. I could find no trace of intestinal cæca. Nitzsch has shown that the oil-gland is tufted, and that there are ten rectrices.

In my paper on the classification of birds I proposed to distribute the Anomalognatæ into two groups, according to whether the cæca are present and at the same time the oil-gland is nude, or the cæca are absent and the oil-gland is tufted, arranging them in the following manner:—

* P. Z. S. 1873, p. 464.

† P. Z. S. 1874, p. 116.

‡ *Vide* P. Z. S. 1875, p. 339.

PICIFORMES.

With tufted oil-gland and without cæca.

- { *Pici.*
- { *Capitoninæ.*
- { *Ramphastinæ.*
- { *Upupidæ.*
- { (*Coliidae*).
- { *Bucerotidæ.*
- { *Alcedinidæ.*

PASSERIFORMES.

With nude oil-gland and with cæca.

- Passeres.*
- Bucconidæ* (? as to cæca).
- Trogonidæ.*
- Meropidæ.*
- Galbulidæ.*
- Caprimulgidæ.*
- { *Coraciidæ.*
- { *Momotidæ.*

From what has been said above it is evident that *Colius* must be included among the Piciformes, and near those of this division with a left carotid only, a four-notched sternum, and a blended plantar-tendon arrangement. No other piciform bird, however, combines all these characters. In the Alcedinidæ the sternum and plantar arrangement correspond; in the Bucerotidæ *Toccos* agrees as to the carotid and the plantar tendons. The Picidæ (*Picinæ* + *Capitoninæ* + *Ramphastinæ*) have a left carotid, a two-notched sternum, but a specialized plantar-tendon distribution. Consequently the fact that the combination of characters is unique justifies us in retaining the Coliidae in a separate family, related on the one hand to the Picidæ, and on the other to the Alcedinidæ and Bucerotidæ.

Something must be said with reference to the probability of *Colius* having psittacine affinities. It is an interesting fact that in those species of the genus *Cacatua* (*galerita*, *leadbeateri*, *moluccensis*, &c.) in which the oil-gland is not lost, the resemblances (only accidental I assume) to the genus *Colius* are peculiarly numerous. In these *Cacatuce* there is a left carotid artery only, no ambiens muscle, and a myological formula A,XY. Nevertheless I hope that in my paper on the Order Psittaci* the impression left by its perusal is that the Parrots all sprang straight away from a stock with two carotids and an ambiens muscle. Such being the case, and *Colius* most certainly not being a true Parrot, the arguments in favour of its having arisen independently from the psittacine ancestor, and of its having undergone (also independently) cacatuiform modifications during the progress of its evolution, are less easy to accept than those which suppose it to have sprung, as I have above assumed, from the less specialized stock whence has been derived all the Anomalognatæ. The form of the sternum and the distribution of the plantar tendons are in favour of this view of the question.

It may be mentioned that the syrinx of *Colius* (which has been figured by Johannes Müller† in a closely allied species) is most nearly related to that of *Ceryle* among the Kingfishers.

* P. Z. S. 1874, p. 586.

† Ueber die bisher unbekanntenen typischen Verschiedenheiten der Stimmorgane der Passerinen, 1847, pl. v. figs. 9-12.